

NAVSEA  
STANDARD ITEM

FY-12

ITEM NO:	<u>009-113</u>	
DATE:	<u>30 JUL 2010</u>	
CATEGORY:	<u>II</u>	

1. SCOPE:

1.1 Title: Rotating Electrical Equipment with Sealed Insulation Systems (SIS); rewind

2. REFERENCES:

2.1 Standard Items

2.2 MIL-STD-2037, Procedure to Obtain Certification for Electric Motor Sealed Insulation Systems

2.3 Equipment Technical Manual

2.4 S9086-KC-STM-010/CH-300, Electric Plant - General

2.5 S9086-KE-STM-000/CH-302, Electrical Motors and Controllers

2.6 S9086-KN-STM-010/CH-310, Electrical Power Generators and Conversion Equipment

2.7 S9086-HN-STM-010/CH-244, Propulsion Bearings and Seals

2.8 S6260-BJ-GTP-010, Electrical Machinery Repair, Electric Motor Repair, Shop Procedures Manual

2.9 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety

3. REQUIREMENTS:

3.1 Only Repair Activities certified by Naval Sea Systems Command (NAVSEA) in accordance with 2.2 may rewind motors with a Sealed Insulation System.

3.1.1 Submit one legible copy, in hard copy or electronic media of the NAVSEA Certification Recertification letter confirming the Repair Activity has fulfilled the requirements for the Sealed Insulation System process. The NAVSEA letter shall indicate the type of motors and the range of motor frame sizes the activity is qualified to rewind.

3.1.2 Submit any change of certification as it occurs to the SUPERVISOR.

3.2 Submit one legible copy, in hard copy or electronic media of any deviations between the NAVSEA-approved Repair Activity SIS Rewind Procedure (SISRP) and this Standard Item for record purposes.

3.3 Prior to disconnecting equipment:

3.3.1 Record and retain electrical hook-up data. Record and retain air gap readings. Record and retain bearing clearances for sleeve bearing equipment only.

3.3.2 Inspect couplings for cracks, broken segments, wear, and misalignment in excess of tolerances specified in 2.3.

3.3.3 Disconnect the equipment electrically and mechanically, using 2.3 for guidance.

3.3.3.1 Matchmark, identify, and retain chocks, shims, shock mounts, sound damping pads, and other accessories associated with equipment.

3.3.3.2 Record shaft thrust and run out readings.

3.4 Remove equipment including rotating components connected directly to the shaft.

3.4.1 Remove entire vaneaxial and tubeaxial fan assemblies from the duct system and transport to the shop for repair.

3.5 Inspect foundations for cracks, areas of distortion, and deterioration in excess of 25 percent of the thickness of each member of the structure.

3.6 Submit one legible copy, in electronic media, of a report listing inspection results, missing parts, defective parts, and measurements taken in 3.3 and 3.5 to the SUPERVISOR.

3.7 Matchmark, disassemble and inspect the equipment removed in 3.4, in accordance with the Repair Activity SISRP, using 2.3 through 2.8 for guidance.

3.7.1 Accomplish a core loss test prior to winding removal in accordance with the Repair Activity SISRP. Record data.

3.7.1.1 Conduct a loop test in accordance with Paragraphs 5.1.2.3.3(a) (1) through (16) or 5.1.2.3.3(b) (1) through (12) as applicable of 2.2 when core indicates a marginal satisfactory reading or when test equipment does not directly support equipment being subjected to testing.

3.7.1.2 Inspect for hot spots in accordance with the Core Loss Tester Instruction Manual.

3.7.2 Remove each winding, in accordance with the Repair Activity SISRP for winding removal and 2.8 for core inspection.

3.7.2.1 Verify the temperature limitations of the core material prior to exercising the burnout oven option. The surface temperature of the laminated iron surface shall be determined by thermocouple and shall not exceed 370 degrees Centigrade (698 degrees Fahrenheit).

3.7.2.2 Record winding data. Verify conformance of recorded data to the manufacturer's winding data.

3.7.2.3 Accomplish a core loss test after winding removal in accordance with the Repair Activity SISRP. Record data.

3.7.2.4 Conduct a loop test in accordance with Paragraphs 5.1.2.3.3(a) (1) through (16) or 5.1.2.3.3(b) (1) through (12) as applicable of 2.2 when core indicates a marginal satisfactory reading or when test equipment does not directly support equipment being subjected to testing.

3.7.2.5 Inspect for hot spots in accordance with the Core Loss Tester Instruction Manual.

3.7.2.6 Dip core iron for preservation in accordance with the Repair Activity SISRP.

3.7.3 Protect machined surfaces. Accomplish the requirements of 009-32 of 2.1, including Table 5, Line 11, for the equipment housing exterior, fan(s), core iron, and interior and exterior of end bells.

3.8 Inspect rotors for cracked bars, localized overheating, rubbing, insulation damage, and burns/hot spots. Record data.

3.9 Inspect and dimensionally measure end bells, frame, rabbet fits, shaft, sleeve and pedestal bearings, keyways, fan and running surfaces for wear, eccentricity, and other defects, using 2.3 for accept or reject criteria, and 2.7 for location and type of measurements to be taken. Record data.

3.10 Submit one legible copy, in electronic media, of a report listing results of the requirements of 3.7 through 3.9 to the SUPERVISOR.

3.11 Rewind the equipment in accordance with the Repair Activity SISRP and the Original Equipment Manufacturer's (OEM) "for Navy use" winding data.

3.11.1 Do not permanently connect winding until after successful completion of testing of 3.11.3 through 3.11.7.

3.11.2 Material shall be in accordance with the Repair Activity SISRP.

3.11.2.1 New temperature detectors shall be in accordance with 2.3.

(V) "INSULATION RESISTANCE TEST"

3.11.3 Accomplish 500-volt megger insulation resistance test in accordance with the Repair Activity SISRP.

(V) "DC RESISTANCE TEST"

3.11.4 Accomplish a DC resistance test of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one milliohm (0.001 ohm) in accordance with the Repair Activity SISRP. Record phase balance for multi-phase equipment.

(V) "VOLTAGE SURGE TEST"

3.11.5 Accomplish a voltage surge test in accordance with the Repair Activity SISRP.

(V) "DC HI POT TEST"

3.11.6 Accomplish a DC HI POT test in accordance with the Repair Activity SISRP.

3.11.7 Accomplish 500-volt megger insulation resistance test in accordance with the Repair Activity SISRP.

3.12 Permanently connect the windings.

3.12.1 Repeat tests described in 3.11.3 through 3.11.7.

(V) "VARNISH TEMPERATURE, VISCOSITY, AND GEL TIME TESTS"

3.13 Select varnish methods and material in accordance with the Repair Activity SISRP.

3.13.1 Maintain the varnish in accordance with the Repair Activity SISRP and the varnish manufacturer's instructions.

3.13.2 Maintain a current revision of the varnish manufacturer's instructions on storage, maintenance, and use of the type of varnish to be applied.

3.13.3 Maintain a record, in accordance with the Repair Activity SISRP, of varnish temperature, viscosity, and, for solventless varnish, gel time tests. Tests must show varnish is within varnish manufacturer's recommendations and have been accomplished in the intervals specified by the varnish manufacturer. The record must also show the varnish is being stored as recommended by the varnish manufacturer.

3.14 Insulate the windings using the Vacuum Pressure Impregnation (VPI) procedure in accordance with the Repair Activity SISRP.

3.14.1 Do not immerse the leads.

3.14.2 Wipe surfaces that affect assembly such as rabbet fits and mounting flanges with a cloth moistened with a solvent after draining and before baking.

3.15 Remove excess varnish runoff from the component locations described in 3.14.2 after final baking.

3.16 Prime equipment housing, fan(s), and end bells with one coat F-84 Alkyd Zinc Molybdate TT-P-645 (1.5 mils dry film thickness).

3.17 Submerge wound assembly in fresh water for 24 hours.

3.18 Accomplish a Submerged Insulation test in accordance with the Repair Activity SISRP. Record data.

3.19 Accomplish a 500-volt megger dry insulation resistance test in accordance with the Repair Activity SISRP. Record data.

3.20 Accomplish an AC HI POT test in accordance with the Repair Activity SISRP. Record data.

3.21 Accomplish a Surge Comparison test in accordance with the Repair Activity SISRP. Record data.

3.22 Accomplish a 500-volt megger dry insulation resistance test in accordance with the Repair Activity SISRP. Record data.

3.23 Measure resistance value of each winding temperature detector, using a low voltage ohmmeter. Record data.

3.24 Submit one legible copy, in electronic media, of a report listing results of the requirements of 3.18 through 3.23 to the SUPERVISOR.

3.25 Accomplish the requirements of 009-15 of 2.1 for each rotating assembly.

3.26 Install identification markers on wiring in the external connection box.

3.26.1 Markers shall be aluminum wrap-around type with metal stamped or embossed markings.

3.27 Repair lightly scored areas of frame, end bells, and shaft by manual methods. Recondition threads and fit key to keyway. Step keys shall not be used.

3.27.1 Apply a thin coat of petrolatum to unpainted mating surfaces except for explosion-proof motors that shall have clean, dry mating surfaces.

3.28 Prepare and refinish equipment. Protect machine surfaces, windings, and nameplates from being painted or otherwise damaged.

3.28.1 Accomplish the requirements of 009-32 of 2.1 for each housing, fan, and interior and exterior of each end bell.

3.29 Accomplish the requirements of 009-32 of 2.1 for the foundations of the equipment removed in 3.4.

3.30 Accomplish the following on equipment having other than sleeve-type bearings unless otherwise specified in the invoking Work Item, using 2.8 for guidance.

3.30.1 Except as indicated in 3.30.1.1, install new bearings, seals, fittings, lock washers, and locknuts conforming to 2.3, using 2.7 and Chapter 6 of 2.8 for guidance.

3.30.1.1 Install Type 111, Class 8 (double seal) bearings in motors meeting the criteria identified in Chapter 6 of 2.8. Only double seal bearings identified in Chapter 6 of 2.8 are acceptable for this use.

3.30.1.2 For vaneaxial and tubeaxial fan motors not meeting the criteria of Chapter 6 of 2.8, if not originally furnished or already accomplished during previous repair, install Type 111, Class 8 (double seal) bearings with a C3 (greater than normal) radial internal clearance in place of the Type 111 bearing originally furnished. Install Type 120 bearings in vaneaxial and tubeaxial fan motors originally furnished with Type 120 bearings.

3.30.1.3 Install new label plates with the inscription "DO NOT LUBRICATE" on equipment using double seal bearings (Type 111, Class 8 or Type 120).

3.30.1.4 For equipment converted from re-lubricable bearings to double seal bearings, install pipe plugs on all grease fills and drains.

3.30.2 For equipment not using double seal bearings, lubricate bearings with grease conforming to DOD-G-24508 as required in Paragraphs 244-1.7.7.2 and 244-1.7.7.3 of 2.7.

3.31 Assemble the equipment disassembled in 3.7, using 2.3 through 2.8 for guidance.

3.31.1 Do not use materials containing silicone in the repair and reassembly of equipment with commutator or collector rings.

3.31.2 Install new fasteners conforming to MIL-DTL-1222, Type I or II, Grade 5, zinc coated.

3.31.3 Fasteners requiring a permeability factor of 2.0 or less shall conform to Grade 304 CRES.

3.31.4 Install new gaskets on covers, inspection plates, and between the external connection box and the frame. Gaskets shall conform to MIL-PRF-1149 unless otherwise specified in 2.3.

3.31.5 Adjust air gap as specified in 2.3, plus or minus 10 percent.

3.31.6 Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly not allowed.

3.31.7 Install label plates conforming to MIL-DTL-15024 for those found to be missing or damaged.

(V) "NO-LOAD SHOP TEST"

3.32 Accomplish a no-load shop test of the motor for a minimum of one-half hour.

3.32.1 Verify proper direction of rotation.

3.32.2 After one-half hour, record current and voltage in each phase, speed and bearing temperature rise measured on the equipment's exterior near each bearing.

3.32.3 Submit one legible copy, in electronic media, of the recorded data to the SUPERVISOR.

(V) "OPERATIONAL SHOP TEST (FOR VANEAXIAL/TUBEAXIAL FANS - ASSEMBLY COMPLETELY REASSEMBLED)"

3.33 With the vaneaxial/tube axial fan reassembled, accomplish an operational test for one hour after bearing and stator temperatures stabilize within 1 degree C for three consecutive 15-minute intervals.

3.33.1 Verify proper direction of rotation.

3.33.2 Record current, voltage, frame and bearing temperature rise and speed at 15-minute intervals.

3.33.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit, unless otherwise specified in the invoking Work Item or equipment technical manual.

3.33.3 Measure and record hot insulation resistances of winding to ground immediately upon completion of the operational shop test, using a 500-volt megger.

3.33.4 Submit one legible copy, in electronic media, of the recorded data to the SUPERVISOR.

3.34 Install equipment removed in 3.4.

3.34.1 Remove existing and install new foundation fasteners conforming to MIL-DTL-1222, Type I or II, Grade 5, zinc coated, and self-locking hexagon nuts conforming to NASM-25027, excluding body-fitted bolts and studs.

3.34.2 Remove existing galled or distorted body-fitted bolts and studs and install new fitted bolts and studs conforming to MIL-DTL-1222, Type I, Grade 5.

3.34.3 Fasteners, body-fitted bolts, and studs requiring a permeability factor of 2.0 or less shall conform to Grade 304 CRES.

3.34.4 Align equipment in accordance with 2.3. Measure and record facial and peripheral coupling data.

3.34.4.1 Install chocks, shims, shock mounts, and sound damping pads.

3.34.4.2 Accomplish the requirements of 009-58 of 2.1 for driver and pump shafts.

3.34.5 Connect electrical cables to equipment, using data retained in 3.3.1.

3.34.6 Bond and ground equipment in accordance with 2.9, using new ground straps.

3.34.7 Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly not allowed.

3.34.8 Measure and record the air gap and bearing clearance (sleeve bearing equipment only), insulation resistance (at 500 volts DC), and thrust.

(V)(G) "OPERATIONAL TEST"

3.35 Accomplish an operational test of the assembled equipment at full system capacity for one hour after bearing and stator temperatures stabilize within 1 degree C for three consecutive 15 minute intervals, unless otherwise specified in the invoking Work Item.

3.35.1 Verify proper direction of rotation.

3.35.2 Record current, voltage, frame and bearing temperature rise, and speed at 15-minute intervals. Frame and bearing temperature rise and speed is not required for vaneaxial and tubeaxial fan assemblies.



3.35.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit unless otherwise specified in the invoking Work Item/equipment technical manual.

3.35.3 Measure and record hot insulation resistances of windings to ground immediately upon completion of test, using a 500-volt megger.

3.36 Submit one legible copy, in hard copy or electronic media, of a report listing data recorded in 3.34.4, 3.34.8, 3.35.2, and 3.35.3 to the SUPERVISOR.

#### 4. NOTES:

4.1 This Standard Item is concerned primarily with the requirements to rewind rotating electrical equipment with a sealed insulation system in accordance with 2.2. Each Certified Repair Activity has developed a SIS Rewind Procedure (SISRP) that has been reviewed, approved by and filed with NAVSEA. In most cases, these Repair Activity SISRPs are treated as proprietary and may not be available to the SUPERVISOR for process review. The NAVSEA approved Repair Activity SISRP is the guiding document by which the equipment is to be rewound and supersedes any specification detailed in this Standard Item.

4.2 Equipment technical manual and drawings will be listed in the invoking Work Item.

4.3 Shop test of generator will be addressed in the invoking Work Item.

4.4 The use of silicone is not allowed on any rotating electrical machinery containing brushes.

4.5 For the current list of NAVSEA-certified facilities for Vacuum Pressure Insulation (VPI) Sealed Insulation Systems, contact Naval Surface Warfare Center Carderock Division, Department 934, Phone (215) 897-7245.